CLAIMS

What is claimed is:

I claim:

1. An apparatus, comprising:

a chromatic dispersion compensation module including

a beam spatial orientation device to separate an optical signal into a first polarized light signal and a second polarized light signal, the second polarized light signal being the orthogonal polarization of the first polarized light signal;

a wavelength-dependant delay path coupled to the beam spatial orientation device; and

a polarization rotator coupled to the wavelength-dependant delay path such that the first polarized light signal reflects into the wavelength-dependant delay path in substantially the opposite direction of the second polarized light signal.

2. The apparatus of claim 1, further comprising:

a radiation paralleling device coupled to an input output terminal; the radiation paralleling device also coupled to the beam spatial orientation device.

3. The apparatus of claim 1, wherein the first polarized light signal comprising transverse electric wave.

4. The apparatus of claim 1, wherein the first polarized light signal comprising transverse magnetic wave.

5. The apparatus of claim 1, wherein the beam spatial orientation device further comprises a birefringent walkoff crystal.

6. The apparatus of claim 1, wherein the beam spatial orientation device further comprises a polarization beam splitting prism.

7. The apparatus of claim 1, wherein the wavelength-dependant delay path further comprises tunable cascaded resonator cavities.

8. The apparatus of claim 7, wherein each tunable cascaded resonator connects to a temperature control device.

9. The apparatus of claim 1, wherein the wavelength-dependant delay path further comprises a fiber Bragg grating.

10. The apparatus of claim 1, wherein the wavelength-dependant delay path further comprises a multilayer reflector that creates chromatic dispersion.

11. The apparatus of claim 7, wherein one or more of the tunable cascaded resonator cavities are tuned to a center wavelength by solely changing the temperature of that resonator cavity.

12. The apparatus of claim 7, wherein the wavelength delay path to produce a distortion of the optical signal due to variation in the chromatic dispersion across the passband that incurs a Q-penalty of less than one decibel.

13. The apparatus of claim 1, wherein the polarization rotator further comprises a Faraday rotating mirror.

14. The apparatus of claim 1, wherein the polarization rotator further comprises a quarter wave plate coupled to a resonator cavity.

15. The apparatus of claim 14, wherein the wavelength-dependant delay path includes at least two or more polarization rotators to facilitate the first polarized light signal reflecting through the wavelength-dependant delay path in substantially the opposite direction of the second polarized light signal, and each polarization rotator consisting of the quarter wave plate coupled to the resonator cavity.

16. The apparatus of claim 2, wherein the radiation paralleling device further comprises a collimator.

17. A method, comprising:

separating an optical signal into a first polarized light signal having a first polarization and a second polarized light signal having a second polarization, the second polarized light signal being the orthogonal polarization of the first polarized signal;

routing the first polarized light signal through a wavelength-dependant delay path in a first direction, and the second polarized light signal propagates through the wavelength-dependant delay path in a second direction substantially opposite the first direction.

18. The method of claim 17, further comprising:

collimating a light wave in an optical signal to possess the same angle of incidence.

19. The method of claim 17, further comprising:

changing the resonant center wavelength of one or more segments in the wavelength-dependant delay path by adjusting the temperature in that segment.

20. A method, comprising:

changing optical thickness of one or more resonator cavities in a series of resonator cavities; and

changing a magnitude of chromatic dispersion in a passband of wavelengths by changing the optical thickness such that induced variation in the chromatic dispersion across the passband produces a distortion of an optical signal propagated through the resonator cavities, and wherein the distortion of the optical signal due to variation in the chromatic dispersion across the passband incurs a Q-penalty of less than one decibel.

21. The method of claim 20, wherein the distortion comprises a deviation from the mean value over the passband.

22. The method of claim 20, further comprising:

tuning a center wavelength of the one or more resonator cavities by changing the temperature of that resonator cavity.

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23. The method of claim 20, further comprising:

changing the optical thickness of the one or more resonator cavities by changing the temperature in the series of resonator cavities.

24. An apparatus, comprising:

means for separating an optical signal into a first polarized light signal having a first polarization and a second polarized light signal having a second polarization, the second polarized light signal being the orthogonal polarization of the first polarized signal;

means for routing the first polarized light signal through a wavelength-dependant delay path in a first direction, and the second polarized light signal propagates through the wavelength-dependant delay path in a second direction substantially opposite the first direction.

25. The apparatus of claim 24 further comprising:

means for collimating a light wave in an optical signal to possess the same angle of incidence.

26. The apparatus of claim 24 further comprising:

means for changing a magnitude of chromatic dispersion in a passband of wavelengths by changing the optical thickness such that induced variation in the chromatic dispersion across the passband produces a distortion of an optical signal propagated through the resonator cavities, and wherein the distortion of the optical signal due to variation in the chromatic dispersion across the passband incurs a Q-penalty of less than one decibel.

27. An optic transmission system, comprising:

a transmitter;

a receiver;

one or more chromatic dispersion compensation modules coupled between the transmitter and the receiver, each chromatic dispersion compensation module including

a beam spatial orientation device to separate an optical signal into a first polarized light signal and a second polarized light signal, the second polarized light signal being the opposite polarization of the first polarized signal;

a wavelength-dependant delay path coupled to the beam spatial orientation device; and

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a polarization rotator coupled to the wavelength-dependant delay path such that the first polarized light signal reflects into the wavelength-dependant delay path in substantially the opposite direction of the second polarized light signal.

28. The system of claim 27, further comprising:

an input-output circulator coupled to the chromatic dispersion compensation module.

29. The system of claim 27, wherein the polarization rotator further comprises a quarter wave plate coupled to a resonator cavity.

30. The system of claim 28, wherein the wavelength-dependant delay path includes at least two or more polarization rotators to facilitate the first polarized light signal reflecting through the wavelength-dependant delay path in substantially the opposite direction of the second polarized light signal, and each polarization rotator consisting of the quarter wave plate coupled to the resonator cavity.

31. The system of claim 27, wherein the polarization rotator further comprises a forty-five degree Faraday rotator coupled to a resonator cavity.

32. A chromatic dispersion compensation module, comprising:

a collimator;

a first beam spatial orientation device coupled to the collimator;

a first polarization rotator coupled to the first beam spatial orientation device;

a first resonator cavity coupled to the first beam spatial orientation device;

a first temperature control device coupled to the first resonator cavity;

a second beam spatial orientation device;

a second polarization rotator coupled to the second beam spatial orientation device;

a second resonator cavity coupled to the second beam spatial orientation device; and

a second temperature control device coupled to the second resonator cavity.

33. The apparatus of claim 32, further comprising:

a second polarization rotator; and

a third beam spatial orientation device coupled to the first polarization rotator and the second polarization rotator.

34. The apparatus of claim 33, wherein the first polarization rotator further comprises a forty-five degree Faraday rotator coupled to a half wave plate.

35. The apparatus of 33, wherein the first polarization rotator couples to the first beam spatial orientation device and the second polarization rotator couples to the second beam spatial orientation device such that a first polarized light signal and a second polarized light signal having the orthogonal polarization of the first polarized light signal travel substantially similar paths through the chromatic dispersion compensation module.

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36. The method of claim 20, further comprising:

changing the optical thickness of the one or more resonator cavities by changing the stress on the series of resonator cavities.